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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/605,087	09/08/2003	Rama Divakaruni	FIS920030007	2086

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INTERNATIONAL BUSINESS MACHINES CORPORATION
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EXAMINER	
THOMAS, TONIAE M	

ART UNIT	PAPER NUMBER
2822	

DATE MAILED: 04/05/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

H·A

Office Action Summary	Application No.	Applicant(s)	
	10/605,087	DIVAKARUNI ET AL.	
	Examiner	Art Unit	
	Toniae M. Thomas	2822	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *07 January 2005*.

2a)☒ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-17* is/are pending in the application.

4a) Of the above claim(s) *14-17* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-8, 13* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *08 September 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. This action is an official response to the amendment filed on 07 January 2005. Currently, claims 1-8 and 13-17 are pending. Claims 14-17 have been withdrawn from further consideration as being drawn to a nonelected invention.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. *Claims 1-8 and 13 are rejected under 35 U.S.C. 102(b) as being anticipated by Radens et al. (US 6,437,388 B1).*

The Radens et al. Patent (Radens) discloses a method of forming an array of DRAM cells (figs. 3-13 and accompanying text). The method comprises the following steps: forming trench capacitors in a first set of trenches 12 in a semiconductor substrate 14, wherein each capacitor comprises a buried plate 16, a capacitor dielectric 17, a collar 18, and a storage node 20 (fig. 3 and col. 4, line 63 – col. 5, line 7); forming vertical transistors above the trench capacitors in the first set of trenches, the vertical transistors having a transistor body region at a body depth, wherein each of the vertical transistors comprises a gate oxide layer 30 and a gate conductor 28 (fig. 3 and col. 5, lines

14-22), and wherein the capacitors and vertical transistors are connected by a set of buried straps 24 formed at a strap depth in a layer of the substrate (fig. 2); forming a second set of trenches in the substrate, the second set of trenches being disposed between members of the first set of trenches (fig. 5 and col. 6, lines 3-9), the second set of trenches having an insulating liner 44 at the strap depth (figs. 6, 7, and col. 6, lines 14-21), whereby potential paths between adjacent buried straps in the first set of trenches are blocked from forming; nitriding the interior surface of the second set of trenches, such that conduction is not hindered above the insulating liner 44 and at the body depth above the strap depth (fig. 7 and col. 6, lines 40-44);[1] and the second set of trenches contain a vertical conductive path 42 connecting body regions in the substrate 14 at a level above the strap 24 depth and bias regions in the substrate at a level below the strap 24 depth (fig. 5 and col. 6, lines 3-9).

The second trenches are etched within upper and lower regions of a well 40, such that the upper and lower regions of the well are connected by a conductive path 42 (fig. 5). The well 40 is formed prior to the formation of the second set of trenches (fig. 4 and col. 5, lines 42-47).

The liner 44 is formed on the interior surfaces of second set of trenches, and etched on the bottom surface of the second set of trenches, so that the

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[1] The out diffusion regions 62 shown in fig. 8 clearly show that the nitriding of the interior surface of the second trenches does not hinder conduction above the insulating liner 44 and at the transistor body depth above the depth of the strap 24 (fig. 8 and col. 6, lines 63-65).

conductive path extends to the substrate through the bottom surface (fig. 6 and col. 6, lines 22-25).

Each of the second set of trenches is filled with a conductive material 48 (fig. 6 and col. 6, lines 24-28). Subsequently, the conductive material is diffused into the substrate at region 50 (fig. 6 and col. 6, lines 29-33).

The each of the second set of trenches is formed with a transverse dimension that is the minimum distance permitted by lithography (figs. 4, 5, col. 5, lines 57-61, and col. 6, lines 3-7).

Response to Arguments

3. Applicant's arguments filed 07 January 2005 with respect to amended claim 1 have been fully considered, but are not persuasive. The Applicant argues that:

> **"the combination of Radens and Hodges does not meet or suggest the clams as amended."**

Claim 1 has been amended to recite the limitation "nitriding the interior surface of the second set of trenches, such that conduction is not hindered above the insulating liner and at the body depth above the strap depth." As explained above, Radens discloses this limitation (see fig. 7 and col. 6, lines 40-44). The out diffusion regions 62 shown in fig. 8 clearly show that the nitriding of the interior surface of the second trenches does not hinder conduction above the insulating liner 44 and at the transistor body depth above the depth of the strap 24. Thus, claim 1 stands rejected under 35 USC 102(b) as being anticipated by Radens.

Conclusion

4. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Toniae M. Thomas whose telephone number is (571) 272-1846. The examiner can normally be reached on Monday-Thursday from 8:30 a.m. to 5:30 p.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amir Zarabian can be reached on (571) 272-1852. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

TMT
02 April 2005

Mary Wilczewski
Primary Examiner